

## Applications

1. A convenience store has been keeping track of its popcorn sales.

**Popcorn Sales**

Time	Total Bags Sold
6:00 A.M.	0
7:00 A.M.	3
8:00 A.M.	15
9:00 A.M.	20
10:00 A.M.	26
11:00 A.M.	30
noon	45
1:00 P.M.	58
2:00 P.M.	58
3:00 P.M.	62
4:00 P.M.	74
5:00 P.M.	83
6:00 P.M.	88
7:00 P.M.	92



- Make a coordinate graph of the data in the table above. Which variable did you put on the  $x$ -axis? Why?
- Describe how the number of bags of popcorn sold changed during the day.
- During which hour did the store sell the most popcorn? During which hour did it sell the least popcorn?

**active math**  
**online**

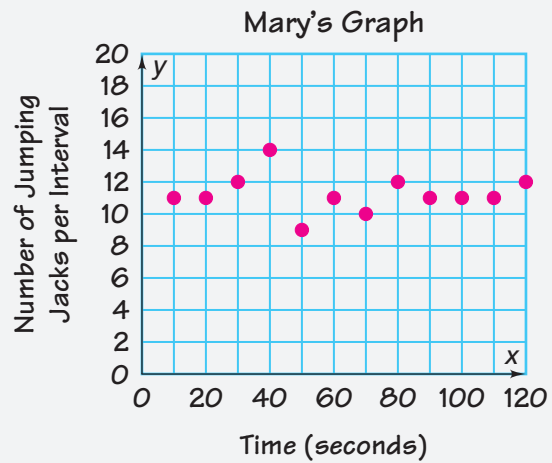
For: Climbing Monkeys  
Activity

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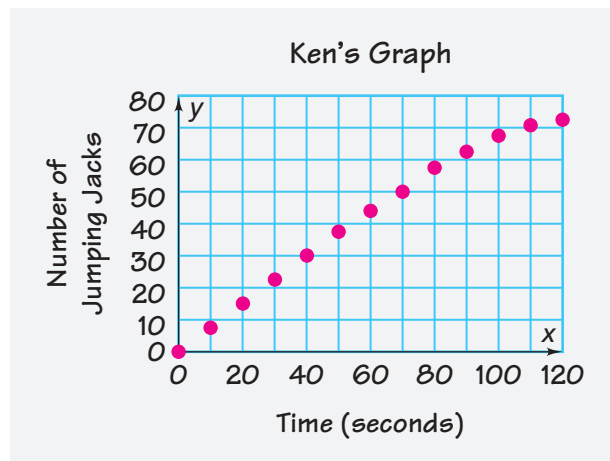
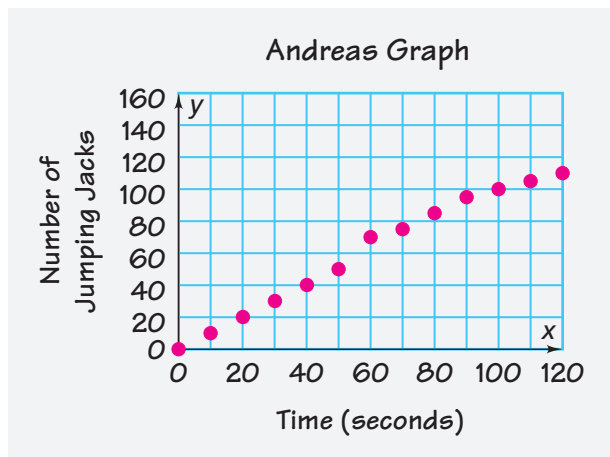
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2. At the right is a graph of jumping jack data. (On the  $x$ -axis, 20 means the interval from 0 seconds to 20 seconds, 40 means the interval 20 seconds to 40 seconds, and so on.)

- What does the graph tell you about Mary's experiment?
- How is this graph different from the graph you made in Problem 1.2?
- What total number of jumping jacks did Mary do?



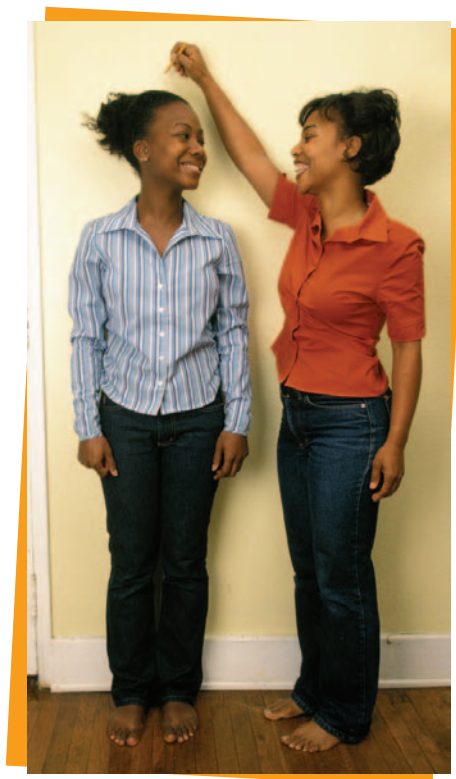
3. After doing the jumping jack experiment, Andrea and Ken compare their graphs. Because the points on his graph are higher, Ken said he did more jumping jacks in the 120 seconds than Andrea did. Do you agree? Explain.



4. Katrina's parents kept this record of her growth from her birth until her 18th birthday.

**Katrina's Height**

Age (yr)	Height (in.)
birth	20
1	29
2	33.5
3	37
4	39.5
5	42
6	45.5
7	47
8	49
9	52
10	54
11	56.5
12	59
13	61
14	64
15	64
16	64
17	64.5
18	64.5



- Make a coordinate graph of Katrina's height data.
- During which time interval(s) did Katrina have her greatest "growth spurt"?
- During which time interval(s) did Katrina's height change the least?
- Would it make sense to connect the points on the graph? Why or why not?
- Is it easier to use the table or the graph to answer parts (b) and (c)? Explain.

5. Below is a chart of the water depth in a harbor during a typical 24-hour day. The water level rises and falls with the tides.

**Effect of the Tide on Water Depth**

Hours Since Midnight	0	1	2	3	4	5	6	7	8
Depth (m)	10.1	10.6	11.5	13.2	14.5	15.5	16.2	15.4	14.6

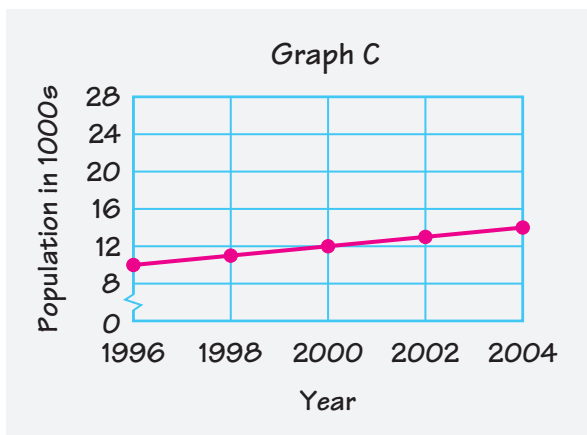
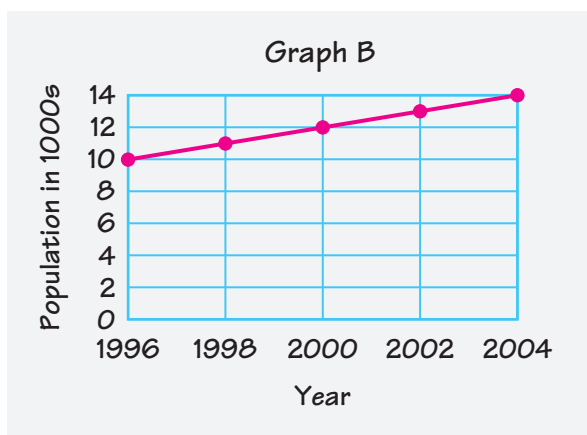
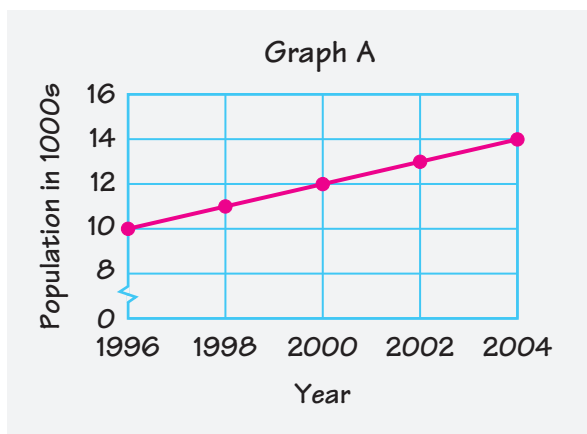
Hours Since Midnight	9	10	11	12	13	14	15	16
Depth (m)	12.9	11.4	10.3	10.0	10.4	11.4	13.1	14.5

Hours Since Midnight	17	18	19	20	21	22	23	24
Depth (m)	15.4	16.0	15.6	14.3	13.0	11.6	10.7	10.2

- At what time is the water the deepest? Find the depth at that time.
- At what time is the water the shallowest? Find the depth at that time.
- During what time interval does the depth change most rapidly?
- Make a coordinate graph of the data. Describe the overall pattern you see.
- How did you determine what scale to use for your graph? Do you think everyone in your class used the same scale?



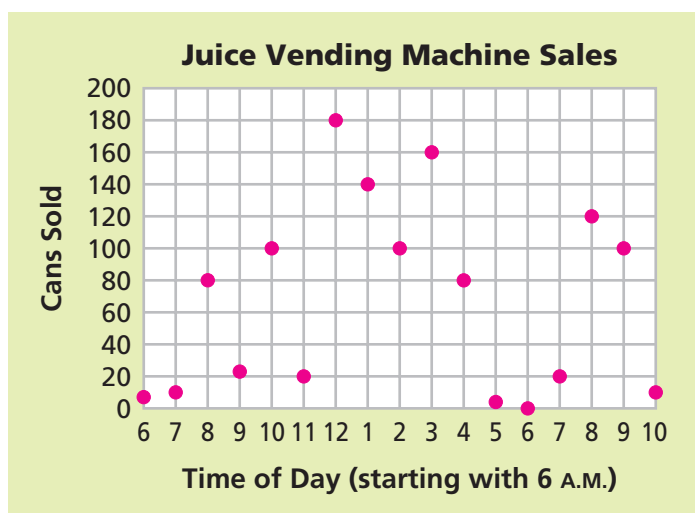
6. Three students made graphs of the population of a town called Huntsville. The break in the y-axis in Graphs A and C indicates that there are values missing between 0 and 8.



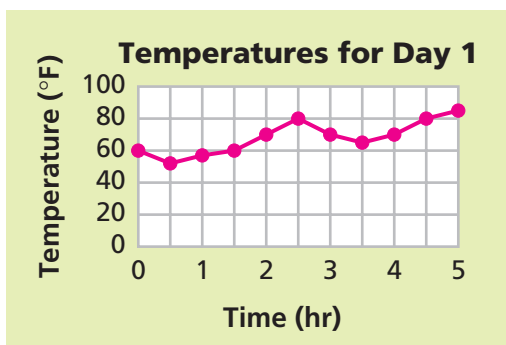
- Describe the relationship between time and population as shown in each of the graphs.
- Is it possible that all three graphs correctly represent the population growth in Huntsville? Explain.



7. On the  $x$ -axis of the graph below, 6 means the time from 5:00 to 6:00, 7 means the time from 6:00 to 7:00, and so on.



- The graph shows the relationship between two variables. What are the variables?
  - Describe how the number of cans sold changed during the day. Explain why these changes might have occurred.
8. Here is a graph of temperature data collected on the students' trip from Atlantic City to Lewes.



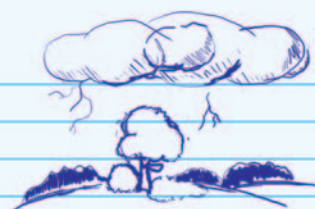
- This graph shows the relationship between two variables. What are they?
- Make a table of data from this graph.
- What is the difference between the day's lowest and highest temperatures?
- During which time interval(s) did the temperature rise the fastest? During which time interval did it fall the fastest?

- e. Is it easier to use the table or the graph to answer part (c)? Why?
- f. Is it easier to use the table or the graph to answer part (d)? Why?
- g. What information can you get from the lines connecting the points? Do you think it is accurate information? Explain.
9. Here is a graph Celia drew on the bike trip.
- a. What does this graph show?
- b. Is this a reasonable pattern for the speed of a cyclist? Is this a reasonable pattern for the speed of the van? Is this a reasonable pattern for the speed of the wind? Explain each of your conclusions.
10. Make a table and a graph of (*time, temperature*) data that fit the following information about a day on the road:

Celia's Graph



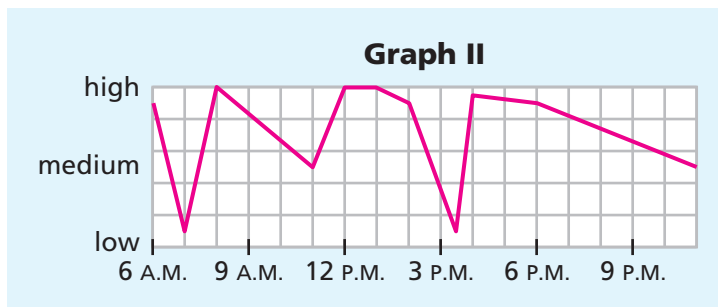
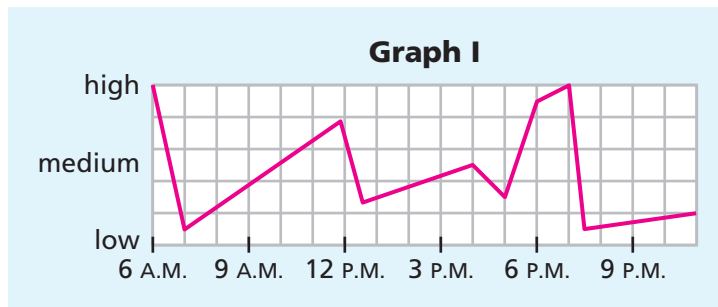
- We started riding at 8 A.M. The day was quite warm, with dark clouds in the sky.
- About midmorning, the temperature dropped quickly to 63°F, and there was a thunderstorm for about an hour.
- After the storm, the sky cleared and there was a warm breeze.



- As the day went on, the sun steadily warmed the air. When we reached our campground at 4 P.M. it was 89°F.

11. When Ben first started to play the electric guitar, his skill increased quite rapidly. Over time, Ben seemed to improve more slowly.
- a. Sketch a graph to show how Ben's guitar-playing skill progressed over time since he began to play.
- b. Your graph shows the relationship between two variables. What are those variables?
- c. What other variables might affect the rate at which Ben's playing improves?

12. Amanda made the graphs below to show how her level of hunger and her feelings of happiness changed over the course of a day. She forgot to label the graphs.



Use the following descriptions to determine which graph shows Amanda's hunger pattern and which graph shows Amanda's happiness. Explain.

**Hunger:** Amanda woke up really hungry and ate a large breakfast. She was hungry again by lunch, which began at 11:45. After school, she had a snack before basketball practice, but she had a big appetite by the time she got home for dinner. Amanda was full after dinner and did not eat much before she went to bed.

**Happiness:** Amanda woke up in a good mood, but got mad at her older brother for hogging the bathroom. She talked to a boy she likes on the morning bus. Amanda enjoyed her early classes, but got bored by lunch. At lunch, she had fun with friends. She loved her computer class, which was right after lunch, but she didn't enjoy her other afternoon classes. After school, Amanda had a good time at basketball practice. After dinner, she did homework and chores.



# Connections

For Exercises 13–15, order the numbers from least to greatest. Then describe how each number in your ordered list can be obtained from the previous number.

13. 1.75, 0.25, 0.5, 1.5, 2.0, 0.75, 1.25, 1.00

14.  $\frac{3}{8}$ , 1,  $\frac{1}{4}$ ,  $\frac{7}{8}$ ,  $\frac{3}{4}$ ,  $\frac{1}{2}$ ,  $\frac{1}{8}$ ,  $\frac{5}{8}$

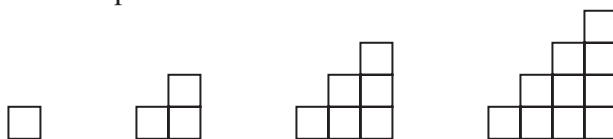
15.  $\frac{4}{3}$ ,  $\frac{1}{3}$ ,  $\frac{1}{6}$ ,  $\frac{4}{6}$ ,  $\frac{8}{3}$ ,  $\frac{32}{6}$



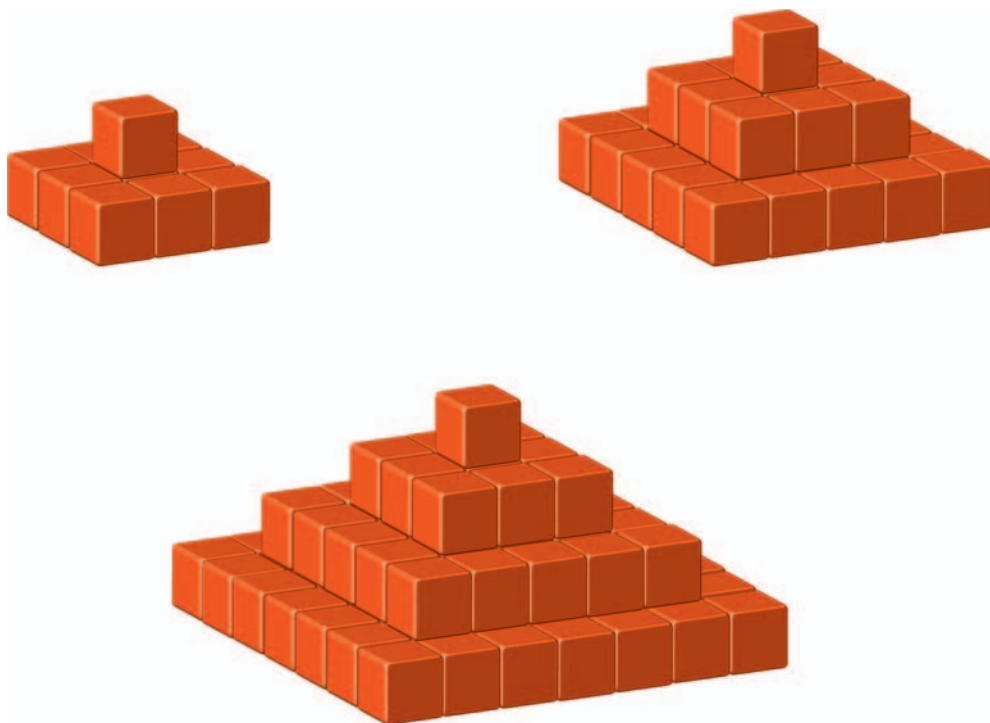
For: Multiple-Choice Skills  
Practice

Web Code: ana-1154

16. Draw the next shape in this pattern. Then, make a table of (*number of squares in bottom row, total number of squares*) data for the first five shapes in this pattern.



17. Make a table to show how the total number of cubes in these pyramids changes as the width of the base changes from 3 to 7.



- 18. Multiple Choice** Suppose you know that there are five blocks in a bag, and one of these is marked “winner.”

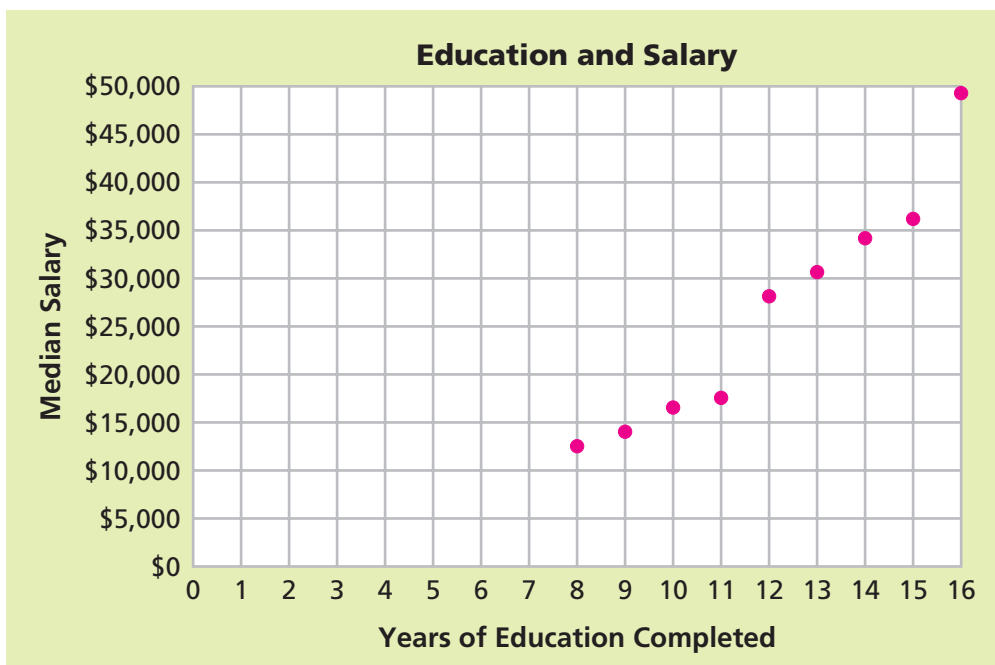


You reach into the bag and choose one block at random. What is the probability you will choose the “winner”?

- A.**  $\frac{1}{5}$       **B.**  $\frac{1}{4}$       **C.**  $\frac{1}{2}$       **D.** None of these
- 19. a.** Suppose you replace the block you chose in Exercise 18 *and* add another “winner” block. Now there are six blocks in the bag. What is the probability of choosing a “winner” if you choose one block at random?
- b.** How does your probability of choosing a “winner” change for every extra “winner” block you add to the bag? Use a table or graph to explain your answer.
- 20.** Suppose you toss a 6-sided die twice to make the coordinate pair (*roll 1*, *roll 2*). You will win a prize if the result is (2, 2), (4, 4), or (6, 6). What is the probability you will win a prize?
- 21.** The directors of Ocean Bike Tours want to compare their plans with other bicycle tour companies. The bike tour they are planning takes three days, and they wonder if this might be too short. Malcolm called 18 different companies and asked, “How many days is your most popular bike trip?” Here are the answers he received:
- 3, 6, 7, 5, 10, 7, 4, 2, 3, 3, 5, 14, 5, 7, 12, 4, 3, 6
- Make a line plot of the data.
- 22. Multiple Choice** What is the median of the data in Exercise 21?
- F.** 3      **G.** 5      **H.** 6      **J.** 14

**Homework  
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For: Help with Exercise 20  
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- 23.** On the basis of the information in Exercises 21 and 22, should Ocean Bike Tours change the length of the three-day trip? Explain.
- 24.** The graph below shows the results of a survey of people over age 25 who had completed different levels of education.



- Make a table that shows the information in the graph.
  - After how many years of education do salaries take a big jump? Why do you think this happens?
  - Do you find it easier to answer part (b) by looking at the graph or at your table? Explain.
- 25.** Think of something in your life that varies with time, and make a graph to show how it might change as time passes. Some possibilities are the length of your hair, your height, your moods, or your feelings toward your friends.



## Extensions

**26.** The number of hours of daylight in a day changes throughout the year. We say that the days are “shorter” in winter and “longer” in summer. The table shows the number of daylight hours in Chicago, Illinois, on a typical day during each month of the year (January is month 1, and so on).

- Describe any relationships you see between the two variables.
- On a grid, sketch a coordinate graph of the data. Put months on the  $x$ -axis and daylight hours on the  $y$ -axis. What patterns do you see?
- The seasons in the southern hemisphere are the opposite of the seasons in the northern hemisphere. When it is summer in North America, it is winter in Australia. Chicago is about the same distance north of the equator as Melbourne, Australia, is south of the equator. Sketch a graph showing the relationship you would expect to find between the month and the hours of daylight in Melbourne.

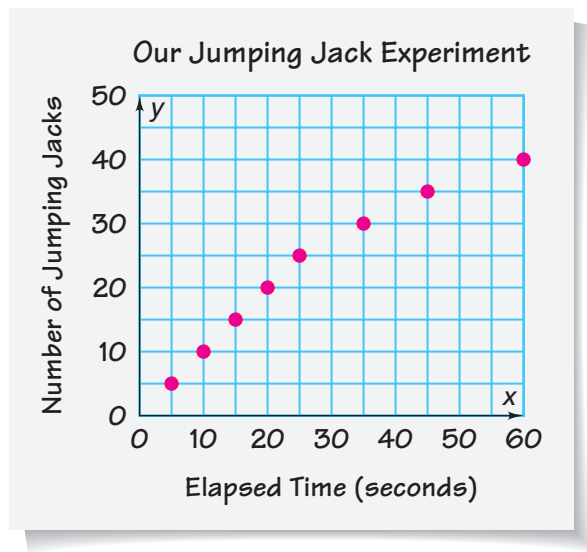
**Daylight Hours**

Month	Daylight Hours
1	10.0
2	10.2
3	11.7
4	13.1
5	14.3
6	15.0
7	14.5
8	13.8
9	12.5
10	11.0
11	10.5
12	10.0

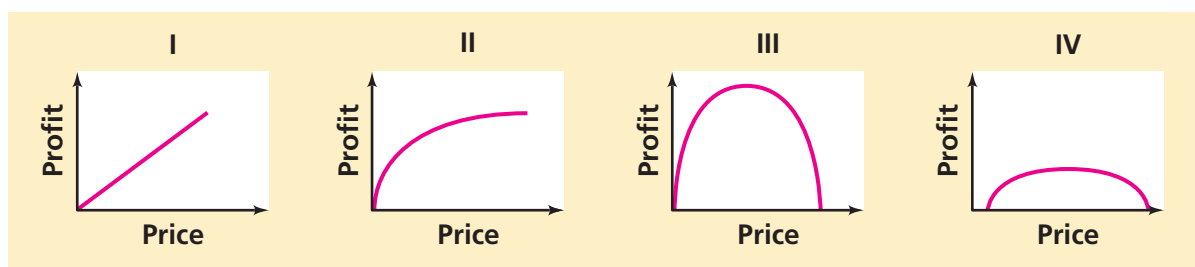


- Put the (*month, daylight*) values from your graph in part (c) into a table.

- 27.** Some students did a jumping jack experiment. They reported their data in the graph below.



- a.** According to the graph, how many jumping jacks did the jumper make by the end of 10 seconds? By the end of 20 seconds? By the end of 60 seconds?
  - b.** Give the elapsed time and number of jumping jacks for two other points on the graph.
  - c.** What estimate would make sense for the number of jumping jacks in 30 seconds? The number in 40 seconds? In 50 seconds?
  - d.** What does the overall pattern in the graph show about the rate at which the test jumper completed jumping jacks?
  - e.** Suppose you connected the first and last data points with a straight line segment. Would this line show the overall pattern? Explain.
- 28. a.** A school booster club sells sweatshirts. Which, if any, of the graphs describes the relationship you expect between the price charged for each sweatshirt and the profit? Explain your choice, or draw a new graph you think better describes this relationship.



- b.** What variables might affect the club's profits?



- 29.** Chelsea and Nicole can paddle a canoe at a steady rate of 5 miles per hour.
- On Saturday, they paddle for 3 hours on a calm river. Sketch a graph of their speed over the 3-hour period.
  - On Sunday, they go canoeing again. They paddle with a 2-mile-per-hour current for 1 hour. Then, they turn into a tributary that feeds the river. They paddle against a 2-mile-per-hour current for 2 hours. On the same axes you used in part (a), sketch a graph of their speed over this 3-hour period.
  - How does the speed of the current affect the speed of the canoe?



- 30.** In parts (a)–(e) below, how does the value of one variable change as the value of the other changes? Estimate pairs of values that show the pattern of change you would expect. Record your estimates in a table with at least five data points.

**Sample** *hours of television you watch in a week and your school grade-point average*

As television time increases, I expect my grade-point average to decrease.

TV Time (hours per week)	0	5	10	15	20
Grade Point Average	3.5	3.25	3.0	2.75	2.5

- distance* from school to your home and *time* it takes to walk home
- price* of popcorn at a theater and *number of bags* sold
- speed* of an airplane and *time* it takes the plane to complete a 500-mile trip
- number of days* you keep a rented DVD and *rental charge*
- length* of a long-distance telephone call in minutes and *cost* of the call